MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

OFFICE AUTOMATION
AND THE
NAVY FINANCE CENTER

by

James L. Barrett

September 1984

Thesis Advisor: Dan C. Boger

Approved for public release; distribution unlimited

85   03   18   009

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A152 126	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Office Automation and the Navy Finance Center		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; September 1984
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) James L. Barrett		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93943		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93943		12. REPORT DATE September 1984
		13. NUMBER OF PAGES 92
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT *(of this Report)* Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)* Office; Office Automation; Electronic Office; Implementation; Navy Finance Center		
20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*		

The availability of computer technology and its continually declining costs has led to its application in the office environment. The use of computers and micro-electronics in the office for the support of secretarial and managerial staff has been given a number of titles, the most common term being "office automation". The road to successful office automation is paved with stumbling blocks. User impatience to acquire

DD _{1 JAN 73} **1473**   EDITION OF 1 NOV 65 IS OBSOLETE

S N 0102-LF-014-6601

office automation, the lack of understanding among senior executives, the proliferation of incompatible components, and unsuccessful pilot projects are some of the challenges that could confront the Navy Finance Center during the implementation of office automation. The purpose of this thesis is to define office automation and its components, recommend a plan to determine its feasibility at the Navy Finance Center, and recommend a methodology for implementation.

N 0102-LF-014-6601

Office Automation and the Navy Finance Center

by

James L. Barrett
Lieutenant Commander, United States Navy
B.S., New Mexico State University, 1975

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the

NAVAL POSTGRADUATE SCHOOL
September 1984

Author: _____
J. L. Barrett

Approved by: _____
D. C. Boger, Thesis Advisor

_____
N. R. Lyons, Second Reader

_____
W. R. Greer, Jr., Chairman, Department of
Administrative Sciences

_____
K. T. Marshall, Dean of Information and
Policy Sciences

3

ABSTRACT

The availability of computer technology and its
continually declining costs has led to its application in
the office environment. The use of computers and micro-
electronics in the office for the support of secretarial
and managerial staff has been given a number of titles, the
most common term being "office automation". The road to
successful office automation is paved with stumbling blocks.
User impatience to acquire office automation, the lack of
understanding among senior executives, the proliferation of
incompatible components, and unsuccessful pilot projects are
some of the challenges that could confront the Navy Finance
Center during the implementation of office automation. The
purpose of this thesis is to define office automation and
its components, recommend a plan to determine its
feasibility at the Navy Finance Center, and recommend a
methodology for implementation.

4

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I.   INTRODUCTION

Efforts to automate the office environment are as old as the office itself. The concepts of office automation are not new. Its tools have been around for quite some time. However, with the introduction of desktop computers and advances in networks, the capability to integrate these office tools into a powerful business utility has become a reality. This convergence of technologies has become a most sought after goal in efforts to increase office productivity, decrease costs, and improve the effectiveness of the organization.

The purpose of this thesis is to provide a implementation strategy for the introduction of office automation into the Navy Finance Center, Cleveland. Office automation, and its computer applications, is still a new and undefined concept as well as a rapidly evolving technology. Chapter II discusses the drive behind office automation and the primary technologies involved in today's office.

Chapter III looks at the Navy Finance Center, its mission, organization, and current technologies employed. Two other corporations are discussed in Chapter IV, Rubbermaid, Inc. and the South Carolina state government.

their roads to successful implementation of integrated automated offices will be reviewed.

The introduction of any automated tool has an impact on the organization. Organizations are in a constant state of change. The addition of automated tools can create adverse affects if not properly managed. Chapter V is a presentation of a pilot approach to office automation.

11

II. INTRODUCTION TO OFFICE AUTOMATION

A.   THE NEED FOR IMPROVED OFFICE TECHNOLOGY

Spiralling costs are forcing prudent managers to seek
new ways of improving productivity and increasing output. As
a result of these efforts, extensive work has been done in
the application of automation to the basic functions of the
office environment. When computers were first introduced in
the 1950's they were used to automate the labor-intensive,
routine functions performed by the accounting and financial
organizations. It soon became apparent that these computers
could also be used to manipulate data and generate the
information necessary to conduct business in today's modern,
complex society. So began the information explosion of the
seventies and early eighties.

As part of the information explosion, the world has been
undergoing an unprecedented increase in the amount of
narrative and textual information. The amount of printed
information is growing at an exponential rate

Since the introduction of the computer for business
application the amount of textual information stored in
computers has dramatically increased. However, the gap bet
ween digital information, accessible from a computer, and
the total information in the world is growing larger. Compu-
ters have not been able to keep up with the information

explosion. The gap is mostly made up of narrative and textual information. It is in this area that computers can be expected to make a great contribution to society in the future. The majority of the work conducted in today's office involves narrative information, instead of the digital information that is stored in computers today.

One of the first studies concerned with office automation was undertaken in 1975 by IBM's Data Processing Division. It investigated the requirements for an integrated office communications system and was to provide the framework for the development of a prototype of such a system. Tables II-1, II-2, and II-3 show the results of the study in terms of the percentage of time spent on each activity by principals (managers and professional workers), secretarial, and clerical workers [Ref. 1: pp. 403-406].

Significantly, of the principals and secretaries surveyed, the results show approximately 50 percent of their time spent in some form of communication, or in the preparation of information to be communicated either internally or externally to the organization. The average time secretaries spent typing is 37 percent, however, this is lower for personal secretaries and higher for those who support more than one principal.

The clerical activity shows a high proportion of time, over 50 percent being spent on handling paper. From this one can conclude that there was a need for a more efficient way

TABLE II-1

PRINCIPAL ACTIVITY SUMMARY

Activities	Average percent of time*			
	Level 1	Level 2	Level 3	All
Writing	9.8	17.2	17.8	15.6
Mail handling	6.1	5.0	2.7	4.4
Proofreading	1.8	2.5	2.4	2.3
Searching	3.0	6.4	6.4	5.6
Reading	8.7	7.4	6.3	7.3
Filing	1.1	2.0	2.5	2.0
Retrieving filed information	1.8	3.7	4.3	3.6
Dictating to secretary	4.9	1.7	0.4	1.9
Dictating to a machine	1.0	0.9	0.0	0.6
Telephone	13.8	12.3	11.3	12.3
Calculating	2.3	5.8	9.6	6.6
Conferring with secretary	2.9	2.1	1.0	1.8
Scheduled meetings	13.1	6.7	3.8	7.0
Unscheduled meetings	8.5	5.7	3.4	5.4
Planning or scheduling	4.7	5.5	2.9	4.3
Traveling outside HQ	13.1	6.6	2.2	6.4
Copying	0.1	0.6	1.4	0.9
Using equipment	0.1	1.3	9.9	4.4
Other	3.1	6.7	11.4	7.7
	100	100	100	100
Total number of principals	76	123	130	329

* Level 1 represents upper management
  Level 2 represents other managers and management
  equivalent personnel
  Level 3 represents nonmanagerial personnel

14

TABLE II-2

SECRETARIAL ACTIVITY SUMMARY

Activities	Average percent of time
Writing	3.5
Mail handling	8.1
Bulk envelope stuffing	1.4
Collating/sorting	2.6
Proofreading	3.9
Reading	1.7
Typing	37.0
Telephone	10.5
Copying or duplication	6.2
Conferring with principals	4.3
Taking shorthand	5.5
Filing	4.6
Pulling files	2.8
Keeping calandars	2.6
Pick-up or delivery	2.2
Using equipment	1.3
Other	2.0
	100
Total number of secretaries	123

TABLE II-3

Clerical Activity Summary

Activities	Average percent of time
Filling out forms*	8.3
Writing*	7.3
Typing*	7.8
Collating/sorting*	5.2
Checking documents*	10.4
Reading*	2.9
Filing**	5.9
Looking for information**	10.2
Telephone	9.2
Copying or duplicating	3.9
Calculating	10.3
Meetings	1.9
Pick-up or delivery in HQ	0.8
Scheduling or dispatching	1.2
Using a terminal	6.3
Other	8.4
Total	100
Total number of clerical personnel	115

* Primary paper-handling activities (41.9%)
** Secondary paper handling activities
(cumulative total = 58 %)

to handle, store, retrieve and reproduce information in order to obtain a gain in productivity.

B. DEFINING OFFICE AUTOMATION

Businesses have been in existence in a variety of ways since the Roman Empire. The office has evolved to the highly sophisticated form we see today as the result of such facts as population growth, production specialization, and technological inventions and innovations. All organizations, no matter what size, have two common needs, to communicate internally and externally, and to process information.

The term "office automation", "office of the future", "electronic office", or "paperless office" is

"...an office comprised of communicating technologies designed to assist in the rapid origination, processing, communication, use, storage, maintenance, and retrieval of information." [Ref. 2: p. 50]

Office Automation (henceforth referred to as OA) is as revolutionary to the office today as the typewriter was to the office at the turn of the century. It is changing the way we do business, the nature of the business, the type of jobs that are performed, as well as how they are performed. Also, OA is significantly affecting the social aspects of the office at the principal, secretarial, and clerical level.

C. TECHNOLOGIES INVOLVED

OA involves the use of five basic technologies concerned with:

Data - information in the form of numbers.

17

- Word - information in the form of written words.

- Image - information in the form of pictures.

- Audio - information in the form of spoken words.

- Communications - sharing information through networks.

The specific products involved in OA are briefly outlined below. This is not an all-inclusive listing but is representative of the available technologies. In most cases the tools involved cut across the basic technologies. For example, optical character recognition systems were originally used to input data but can be used to read pages of text.

1. Data Processing

The processing of data in organizations has become the norm. It has developed from the large centralized computer service to distributed systems where terminals with direct access to computer files are available to many clerical staff. In conjunction with this, there is the development of specialized data bases which users can access to obtain information relevant to the particular aspects or job functions they perform.

2. Personal Computers

Virtually all clerical and managerial staff in offices perform some calculations, and the vast majority have their own pocket calculator. The development of the microcomputer, followed quickly by the personal computer,

has heralded a new level of calculating and processing routine transactions in the office.

The personal computer represents a major development in OA in that it can be used as a terminal to access larger computers and their data bases, thereby expanding the network. Linking personal computers to mainframes not only increases the power of the PC but often frees the mainframe for the massive data handling for which it was designed. Joe Farrelly, Applied Data Research (ADR) Vice President, states:

"Mainframes are often fully loaded and at the same time inefficient in performing certain tasks...These can include editing, prompting, graphics, data manipulation, and data and program browsing. Offloading these functions to the PC makes both the mainframe and the PC more effective." [Ref. 3: p. 16]

In addition, many people are buying personal computers for hobby purposes, but use them in the business environment. The placing of such systems in homes can be the forerunner of what has been termed the "peopleless office", whereby employees have their terminals at home. They receive, process, and return their work via their terminal and thus avoid travel costs.

3. Word Processing

The preparation of text for correspondence, reports, files and many other documents in the office, has been improving with the development of electronic typewriters, magnetic card typewriters and the word processor. Word

19

processors have been in the office environment for over a decade.

There are three basic types of word processing systems available.

a. Standalone units

Standalone units have one workstation and in most cases cannot be upgraded. They use floppy disks for the storage of text. In some cases they have the capability to communicate with other word processing or data systems.

b. Shared resource units

Shared resources systems can have multiple workstations and printers, and hard disk and floppy disk storage. They can be used in a word processing center or spread among secretaries. It is not unusual to have forty to sixty workstations linked to one processing unit. In some cases, each terminal has its own processing power and storage.

c. Text processing packages

As the uses for computers has grown so has the need for better word processing packages which operate on micro, mini, and mainframe computers. The growth of the software industry has provided the user with a multitude of choices in word processing software regardless of the system installed.

4. Professional Workstations

The primary device in the automated office for the office worker is the workstation. The capabilities of a workstation will vary depending upon user requirements. A managerial or professional user will require different functions than that of a secretary or clerical worker, and the professional may require a workstation that is less than half the size of many of today's computer terminals. The workstation must meet the basic operational needs of a professional to obtain satisfactory results. These may include:

- Ability to handle various forms of data including voice, image, and text.

- Programmable.

- Easy to use.

- Able to perform basic accounting functions as well as financial modeling.

- Ability to communicate in all forms to other users.

Workstations which are provided for secretarial or clerical staff will tend to have similar functions to the professional workstation but in reduced format. In addition, they should be controlled as to the level of access they have to information, services and other users.

5. Optical Character Recognition

In the past this involved the use of special type fonts which could be easily recognized by a OCR reader. Today's OCR units are capable of reading all the standard

IBM Selectric-style typefaces: ten and twelve pitch Courier, twelve pitch Letter Gothic, ten and twelve pitch Prestige Elite, ten pitch Prestige Pica and more [Ref. 4: pp. 48-52]. This has allowed one type of optical scanning equipment, the OCR page reader, to become a productive tool in the business world. The basic premise behind adding an OCR unit to a word processing installation is simple. By generating first-draft copy on typewriters, then reading the hard copy into the word processing system via a OCR unit, the relatively expensive word processing workstation is used for what it does best and most productively: the revision and manipulation of text. In addition, it eliminates the need for expensive and time-consuming word processing training.

As more firms convert from paper files to electronic files, the OCR units will become even more essential as a means to enter paper documents into electronic files without time-consuming keyboarding.

6. Micrographics

This form of storage of records and information has been available for many years. It provides a relatively inexpensive method of converting files into films which can be distributed or stored for archieval purposes and which are easily read. Fiches can be simply produced by using a special camera. Alternatively, documents which have been prepared by a computer may be put onto magnetic tape which can be fed into another device which in turn produces fiche.

Some computers may be directly connected to machines which produce fiche called computer output to microfilm (COM).

Fiches may be read by any one of several devices, the most popular of which is a small screen containing a built in projector which projects an image of the fiche onto the screen. The problem with this reader is locating the required page. Several fiche readers are available which are connected to a computer system. To use them, the operator first enters a few keywords associated with the subject, and the computer then scans its catalogs and indexes. Having found the correct entry in the catalog, it then selects the the fiche or fiches and automatically displays them on the microfiche reader screen.

7. Computer Assisted Retrieval (CAR)

Computer assisted retrieval is the process of locating documents with the use of computer stored indexes. Regardless of the storage media of the document, such as, microfilm, hardcopy, or electronic, through the use of programmed code the exact location of the document may be found using the computer.

Electronic storage and retrieval systems employ two types of searching capabilities: keyword search and contextual search [Ref. 5: p. 251].

Most systems index documents by author s name, subject, date issued, and the recipients name. They also include a keyword search field that allows the user to

assign specific words to the document. This allows for the
index to be searched rather than the whole document.

Some systems also allow a contextual search
capability. This type of search involves actually searching
through the content of documents to select those that meet a
certain set of user specified criteria.

8. <u>Electronic Mail/Computer Message System</u>

Mail forms an integral part of an office automation
system, and in many cases electronic mail is one of the
first applications implemented. Basically, it is a system
whereby users can send and receive mail to and from any
other user in an organization. This is done via
workstations, wordprocessing systems, micros, or computer
terminals which are connected to the office communication
system. Usually, a user has a mail station number or
electronic in-basket which holds the mail until it is
downloaded by the recipient. Electronic mail can serve as:

- An electronic distribution mechanism for written
  communication produced by, or passed through, word
  processing.

- A filing and retrieval mechanism for originators and
  recipients of written communications utilizing both on-
  line and archieval file storage.

- An easy and fast method of communication for users.

- A method of reducing the overall handling of paper to
  improve work flow, thus increasing the efficiency and
  cost effectiveness of corporate communications.

Electronic mail and electronic message systems
basically provide the same functions with the main

difference between the two being that electronic mail is a more formalized system which uses text processing to format the content of the mail. Electronic mail, when implemented, needs to fit the existing office environment and must have a "friendly" user interface. Ideally, it should, to some extent, operate in the same way as the existing paper mail system. Tools such as calendar management and meeting scheduling are ancillary services to electronic mail.

4. Facsimile

Equipment for transmission of hard copy information via telephone lines has been available for some time. Physically, a facsimile (FAX) machine is similar to a photocopier; however, its operating principle is entirely different. In simple terms, it converts a picture to a string of electronic signals which can be sent over a telephone wire. At the remote end, the signals are converted back into a picture. Since the signal travels over the telephone network, any two locations with a telephone can communicate using FAX, providing two compatible machines are installed at each end.

One of the main characteristics of a facsimile system is its speed; the faster the transmission, the lower the transmission costs. Three standard speeds are currently in use and the equipment is classified into three groups accordingly. Group 1 is the slowest and Group 3 is the fastest requiring the most expensive equipment. Many Group 3

machines include a range of additional facilities, such as auto-answer, so that they can accept transmission when unattended, picture size variations, and local copying. Generally, Group 3 machines can also operate in the Group 2 and Group 1 mode.

10.   Teleconferencing

Teleconferencing is the use of telecommunication systems to enable a group of three or more people at two or more locations to confer with one another [Ref. 6: p. 11]. There are a multitude of ways this communication process can be performed. For the purpose of this thesis, only three forms will be addressed; audioconferencing, videoconferencing, and computerconferencing.

In the form of the conventional telephone conference call, audioconferencing is almost as old as the telephone. It requires all participants regardless of location to take part simultaneously. Audioconferencing may be enhanced with the augmentation of graphics equipment such as facsimile or two-way electronic blackboards, but they too must be simultaneous.

Videoconferencing is much more complex and expensive than audioconferencing but offers much more in terms of user interaction and participation. It provides a means for personal communication through face-to-face meetings, verbal communications through the use of the telephone, and visual

communications through written format such as letters and memos [Ref. 7: pp. 24-25].

Computerconferencing, which is very similar to electronic mail, permits participants to conduct meetings throughout scattered geographic locations. Using the communications networks, conferees can access, read, and respond with others regardless of whether the others are communicating simultaneously or not.

11. Communications

The systems, features, and applications of OA involve the use of communications systems for inter and intra office situations. In the past, organizations have tended to develop two communications systems, the telephone and telex service and the data network, which have existed side by side without interconnection. Developments in techonology, together with demands for improved speed and efficiency in information flow and transfer, have added impetus to enhance the communications network.

a. Local Area Networks (LAN)

To obtain all benefits of OA from the various products available, it is essential to have them linked in a communication network called a Local Area Network (LAN).

While the linking of OA tools into one communications system or LAN, is an integral part of OA, it is an area where a number of different approaches, standards and protocols have been adopted by OA suppliers. Care has to

27

be taken when planning an OA system to ensure that the devices installed can communicate with each other. Four approaches to local area networking are:

(1) Baseband_Networks. Baseband networks using a coaxial cable over distances up to 2,500 meters at speeds up to 10 megabits per second. An example is Ethernet, which was developed jointly by Xerox Corporation, Intel Corporation and Digital Equipment Corporation [Ref. 8: pp. 76-79].

(2) Broadband_Networks. Broadband networks using standard cable or community television (CATV) coaxial cables can cover distances of 50 miles at speeds up to 20 megabits per second, such as WangNet developed by Wang Laboratories Inc [Ref. 8: pp. 80-86].

(3) Twisted_Pair_Wire. Multi-paired twisted copper wire is the simplest of the LAN media. It is also the most familiar, because it is the transmission medium used in commercial PBX telephone systems to connect the phones to the switch. Depending on the product, it can provide data transmission to a range of 15 kilometers or more at a rate of 9600 bit per second [Ref. 8: pp. 59-60].

(4) Fiber_Optic_Cable_Networks. Fiber optic cable networks with transmission speeds of up to 100 megabits per second. The main disadvantage of fiber optics is the difficulties associated with connecting additional devices; however, it has a major advantage in having low

susceptibility to electromagnetic interference [Ref. 8: pp. 62-65].

In addition to the LAN, the OA system must provide communication facilities to centralized and decentralized computer systems and networks, other LANs, and devices at remote locations. These requirements can be met by standard communication facilities. Various protocols are usually supported by computer vendors. There are several devices in the marketplace which claim to be able to take the protocol from one device and convert it to one supported by another device. It is necessary to test these devices to ensure compatibility before making the decision to use them or to mix protocols in a network.

An additional telecommunication facility which provides cheaper transmission is packet switching. This involves sending data in packets over the public network rather than via a private leased line. The Consultive Committee for International Telephone and Telegraph (CCITT) standards are followed in this case, mainly the X.25 protocol.

b. Private Branch Exchanges (PBX)

Private Branch Exchanges have been in use since the early 1900s. However, as technology has progressed over the decades, they have undergone significant changes from manual, patch-cord systems to fully automated microprocessor controlled switching systems of today.

29

There are several acronyms used when referencing Private Branch Exchanges, they are:

(1) Key Telephone System (KTS). A KTS uses multi-button telephone sets on which more than one outside line terminates. Several users can answer or make calls on more than one line.

(2) Private Branch Exchange. A PBX consists of central office trunks, at least one switchboard, and extension telephones connected to the trunks or to each other manually through the switchboard [Ref. 8: p. 191].

(3) Private Automatic Branch Exchange (PABX). A PABX is also a system consisting of central office trunks, at least one switchboard, and a series of extension telephones. However, most major system functions are handled automatically, without operator intervention. System control is accomplished either mechanically or electronically. In the latter case, this is done by means of a Electronic Private Automated Branch Exchange (EPABX) [Ref. 8: p. 191].

(4) Computerized Branch Exchange (CBX). A CBX is a type of EPABX that provides a number of features programmed into the system's built-in computer by means of a software package. This can be changed by the local technician as the need arises [Ref. 8: pp. 191-199]. The latter three types of PBX's are basically the same; therefore the acronym PBX will be used to refer to all three.

The use of a PBX as a LAN is a viable alternative. The advantages seen are: [Ref. 9: pp. 63-68]

- Use of the telephone cable plant for data switching.

- Relatively inexpensive premise-distribution cable.

- A wide range of protocols and transmission speeds.

- Modem-pooling. Modems can be accessed on an as-needed basis.

- Ability to queue on a busy terminal or computer port.

There are also several disadvantages related to the use of a PBX as an LAN, these are:

- Both office systems and telephone system operate off the same processor or processors. System testing, hardware reconfigurations and software upgrades can affect the entire office system. In addition, system failure could cripple the organization.

- Slower switching capabilities than most LANs.

- Capacity of the PBX CPU.

The PBX offers a natural migration opportunity for the implementation of LAN capabilities and provides a viable alternative for implementation. Although either a dedicated LAN or PBX may be sufficient for some users, some may find that a combination of the two may better suit their organization.

D.   USE IN THE GOVERNMENT

In order to identify the use of OA technology, a survey was conducted among the participants at the Association of Records Management and Administrators' national conference held in Atlanta in October, 1982. Those surveyed included varying types of businesses including manufacturing.

31

government, banking, energy, education, and more. Of the 172 surveyed 91 were from local, state, or federal government. Table II-4 is an excerpt of that survey [Ref. 10: p. 51].

Not suprising is the high level of use in the word processing and data processing areas. What this survey does imply is that the technology is in use but due to the low use of electronic mail, teleconferencing, and executive workstations perhaps only 23 to 31 percent of those surveyed employ a fully integrated office automated system.

TABLE II-4

PERCENTAGE USE OF TECHNOLOGY

Technology	Government	All Respondents
Word Processing	90.1	94.9
Data Processing	92.3	97.0
Micrographics (In-house)	86.8	79.3
Micrographics (Contracted)	40.7	46.2
COM	65.9	69.9
Facsimile	31.9	54.3
OCR	26.4	34.1
Electronic mail	17.6	30.9
Teleconferencing	23.1	32.8
Computerconferencing	8.8	14.0
Exec. workstations	19.8	23.1

E. PERHAPS A SMALL SLICE

The true electronic office with electronic mail, data processing, appointment calendars and other trappings of a high technology environment may not be appropriate for all organizations. Each organization must evaluate itself to determine what automated office tools are required and the

best approach to integrate these tools into the office

arena.

III. NAVY FINANCE CENTER

A. NAVY FINANCE CENTER BACKGROUND

Originally the Field branch of the Bureau of Supplies and Accounts, the Navy Finance Center (NFC) has been located in Cleveland since 1942. The NFC is the largest of twenty-four naval activities in Ohio. The Navy Finance Center is a shore activity under the command of the Deputy Comptroller of the Navy. Area coordination is maintained by the Commander, Naval Base, Philadelphia. NFC employes over 1430 civilian personnel and approximately 300 military personnel.

B. MISSION

The mission of the Navy Finance Center to:

"Plan, design, develop, implement and administer Navy active duty, retired, and reserve pay systems; perform examination, accounting, disbursing, financial reporting and local logistical and military support functions; and perform such other functions as assigned by the Deputy Comptroller of the Navy." [Ref. 11: p. 2]

C. ORGANIZATION

The Finance Center is divided into two intracity locations. The majority of the tasks are performed at the Federal Building in downtown Cleveland. The Data Processing Department, including the mainframe computer, is located in the Bratenahl Computer Annex approximately five miles from the Federal Building. The organization structure is

outlined in the organizational chart shown in Figure 3.1 [Ref. 11: p. 1].

There are three primary departments or directorates that have a direct impact on OA and its technology. These are the Information Systems Directorate (Code 5), the Planning and Resource Management Department (Code 04) and the Administrative Services Department (Code 01).

1. Information Systems Directorate

The Information Systems Directorate is responsible for, among other things, (1) the control, custody, and operation of ADPE for the Data Center and (2) the control of procurement, installation, and maintenance of required software and hardware in support of the NFC mission [Ref. 11: p. 130].

2. Planning and Resource Management Department

The Management Planning Division (Code 042) of this department is basically tasked with the internal improvement of managerial effectiveness in the NFC. They are responsible for the administration of several Command Programs of which one is Office Systems Technology. This program tasks them with the responsibility

> "...for facilitating greater office productivity Center-
> wide through the investigation, recommendation.
> implementation and promotion of modern office systems
> technology. Concurrently administers the Center's office
> equipment, micrographics, reprographics and word
> processing programs." [Ref. 11: p. 27]

35

Commanding Officer
Executive Officer

Executive Staff

Deputy EEO Officer

Position Management Office

Information Systems Dictorate
Systems Department
Data Processing Department

JUMPS Operations Dictorate
Technical Department Department
Operational Support Department
Special Claims Department
Accounts Processing Department
Special Processing Department

Accounting and Finance Department
Reserve Pay Department
Retired Pay Department
Personnel Support Activity Department

Administrative Services Department
Civilian Personnel Department
Planning & Re-sources Manage-ment Department
Medical Services Department
Facilities Management Department

Figure 3.1. Navy Finance Center Organizational Chart

36

Administrative Services Department

The Communications Division (Code 011) of the Administrative Services Department is responsible for the telephone (PBX) and Automatic Digital Network (AUTODIN) communications. They maintain the facsimile machine in addition to providing source document microfilm service and act as the NFC distribution for Computer Output Microfilm (COM) [Ref. 11: p. 13]. COM services are contracted out to the Navy Publications and Printing Services.

D.   INSTALLED EQUIPMENT

The Finance Center has many of the basic components that can be used in automating the office activities. In the design of an integrated office system, the compatibility of these assets should be investigated for their use in the network. Some of NFC's assets include the following:

1.   Dedicated Word Processors

NFC currently has two Wang systems installed. The first system installed was the OIS 140 Model 3 with 160 megabytes of storage available. In order to keep up with word processing demand another system was installed, the OIS 145. The OIS 145 has a storage capacity of 296 megabytes. Although each have 32 ports available, only 24 can be used for workstations. Currently the OIS 140 serves 18 intelligent workstations and the OIS 145 serves 10. In addition, the OIS 145 has a graphics package and the 6300 graphic workstation with another 6300 on order [Ref. 12].

2. Microcomputers

Typical of many businesses today the proliferation of the microcomputer has left NFC with a rainbow of varying brands. Some of the micros in use at NFC are the IBM PC, Zenith Z100, Radio Shack, Kaypro, and Quasar.

3. Mainframe

The mainframe computer and all peripherals, with the exception of most terminals, are products of IBM. The computer itself is composed of both 3081s and 4341s. The terminals are directly wired into mainframe and there is no dial up system. The network is the IBM System Network Architecture (SNA) and is composed of four 56K baud lines [Ref. 13].

4. Photocopiers

NFC has Kodak and Royal copiers installed. The three Kodak copiers are for high volume copying and include two different models, the 150FS and the 100F. The thirteen remaining copiers are Royal products and include two model 122s, eight model 130s, two model 115s, and a single model 145. All the photocopiers are leased with the exception of the Royal model 115s [Ref. 14].

5. Dictation Equipment

Two dictation systems are installed, both Dictaphone Corporation products, in the Information Systems Directorate. Accessed by different phone lines they are

located in the Federal Building and the Bratenahl Computer Annex [Ref. 15].

6. Facsimile

NFC has a single facsimile machine installed, a Digital Equipment Corporation (DEC) Information System product [Ref. 16].

E. NFC OA SUITABILITY

NFC is an excellent candidate for OA. The majority of the tasks inherent in managing an organization this size revolve around the office. Their primary product is the management of the Navy pay system. In this regard, most of the departments provide information or support so that the four pay-related departments can produce this product.

The assets currently held by NFC already provide limited automated capabilities. However, connecting these assets together in a local network could increase their utility many times.

Compatibility among the current tools is a problem. If connecting these tools is desired, then some type of controls must be incorporated. What may be required may not necessarily be control over the assets but control over their procurement to ensure future compatibility among current assets and future products.

IV. IMPLEMENTATION REVIEW

A. INTRODUCTION

In this section the OA implementation methodologies of Rubbermaid Inc. [Ref. 17: .pp 29-31] and the state government of South Carolina [Ref. 18: .pp 27-32] will be reviewed.

B. RUBBERMAID

Rubbermaid Inc. is a major manufacturer of household products and business supply accessories headquartered in Wooston, OH.. Rubbermaid is an international corporation with operations in the U.S., Canada, and West Germany.

1. Rubbermaid's Approach

After the recognition of the need for OA by Rubbermaid, the first phase entered was an OA study. This involved a comprehensive study of users' communication needs, in addition to framing the equipment and training requirements. OA objectives were set down in terms of a five year planning cycle. The six OA objectives outlined by Rubbermaid were:

- To provide OA equipment advantageous to the company, the tasks, and the people involved.

- To develop a comprehensive approach that encompasses WP, information management, communications, and the physical environment.

- To maintain a leadership role and clearinghouse function for office systems throughout the company.

40

- To present OA concepts and new directions through an internal education program.

- To facilitate the introduction of office technology with close attention to behavioral considerations.

- To evaluate the automated office systems periodically and enhance their operation.

Following completion of the study phase upper management received a presentation of the findings. Upon receipt of support of upper management and the authority to proceed, Rubbermaid took what they refered to as the Pyramid approach to OA. This approach provides a path for Rubbermaid to follow in order to reach their desired OA goals.

The pyramid's foundation is based upon the basic needs, determined in the study phase, of WP, dictation, facsimile, and space planning and builds up to an apex of an integrated information network. The pyramid used by Rubbermaid is shown as Figure 4.1.

The second phase involved the laying of the foundation (WP, dictation, etc.) and the second level of the pyramid, advanced communication capabilities to link the foundation equipment to OCR and photocomposition equipment.

The third phase implemented the electronic filing system and a data base management system. This facilitated information sharing and access to shared databases.

The phases continue upward until the apex is reached and the goal has been obtained. At this apex, all the systems interconnect; people, procedures, and equipment join into a single powerful integrated network.

```
                          /\
                         /  \
                        /    \
                       /      \
                      /INTEGRATED\
                     /INFORMATION \
                    /   NETWORKS   \
                   /  AND SYSTEMS   \
                  /------------------\
                 /  MULTIFUNCTIONAL   \
                MANAGEMENT WORKSTATIONS
               /------------------------\
             MULTIFUNCTIONAL ADMINISTRATIVE
            /     SUPPORT WORKSTATION      \
           /--------------------------------\
          INTELLEGENT COPIERS/LASER PRINTERS
         /----------------------------------\
        /    ELECTRONIC MAIL NETWORK          \
       /--------------------------------------\
      /   ELECTRONIC FILES/SHARED DATABASES     \
     /--------------------------------------------\
    ADVANCED COMMUNICATIONS/OCR/PHOTOCOMPOSITION
   /------------------------------------------------\
  WORD PROCESSING/DICTATION/FACSIMILE/SPACE PLANNING
 /----------------------------------------------------\
```
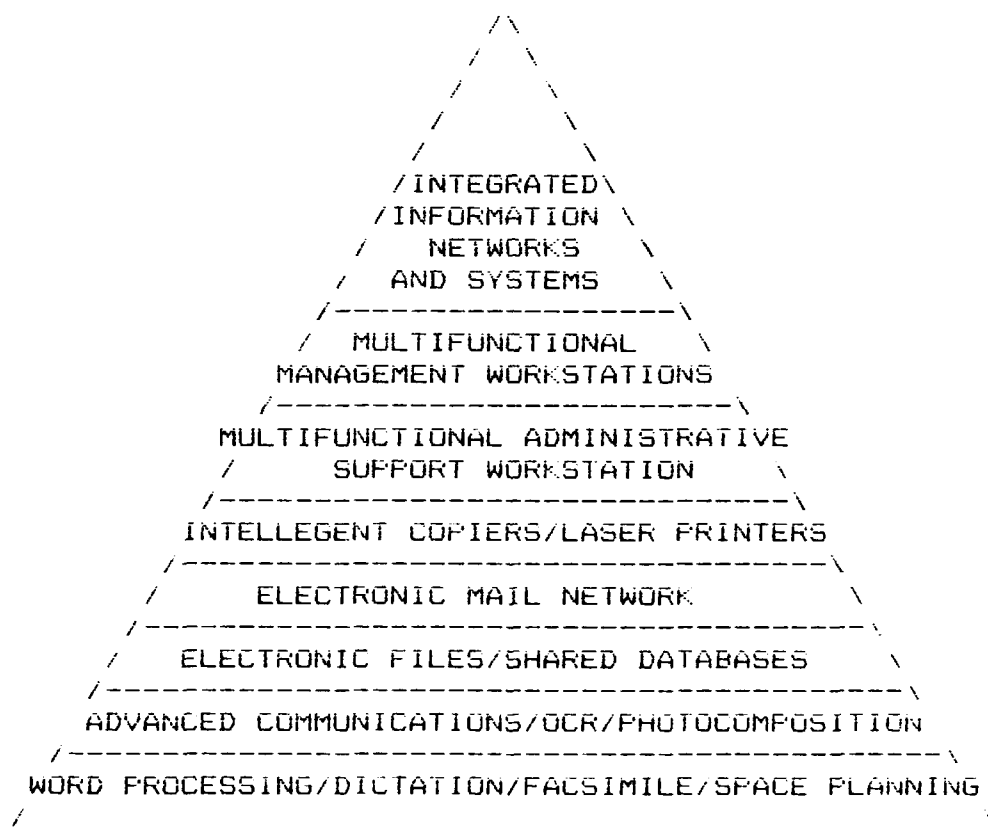
Figure 4.1.   Rubbermaid s Pyramid Approach

42

Although the pyramid shows only the vertical integration of OA, Rubbermaid was simultaneously integrating the system horizontally. Upon automating specific functions at particular locations, these functions were integrated locally and then the necessary links were developed to connect divisions and plants.

The OA effort was first implemented in the executive area of the Wooster headquarters, then spread to Home Products, also in Wooster, and out to Commercial Products, located in Cleburne, Texas, and Winchester, Virginia.

Rubbermaid initially maintained a hands off policy regarding the use of PC's throughout their corporation. Rather than attempting to predetermine the PC's role in the automated office they have elected to let managers experiment with them.

In January 1984 there were only 19 PCs in use at Rubbermaid. The primary application was for spreadsheets. Application profile sheets were developed in order to determine the PC's role along with how and when to integrate them into the company's information network.

2. Rubbermaid's OA System

The Rubbermaid OA system is composed of Wang OIS 140 and OIS 50 text editing equipment; IBM personal computers; computers from Four-Phase, Hewlett-Packard, and Honeywell; and Lanier dictation equipment. All are implemented for future interconnection and compatibility.

43

B. Rubbermaid Summary

Perhaps one of the most important steps of any office automation plan is to identify the organization's needs and formulate a stategy for meeting them. Rubbermaid's pyramid provides a map and an explicit calendar of progress for them to follow enroute to their automated office goal. The foundation of the pyramid is not the first level shown in Figure 4.1 but the invisible foundation of the corporation's study of itself and its needs.

C. SOUTH CAROLINA STATE GOVERNMENT

The state of South Carolina found itself facing a fluctuating economy and rising operating costs while at the same time trying to keep up with a growth in demand for services. South Carolina turned to OA as a means to reduce operating costs and increase office productivity. They initiated a OA pilot program in order to determine how automated office technology could help achieve these objectives.

1. South Carolina's Approach

The first step was to initiate a preimplementation study to review the current workloads of offices, identify potential productivity improvement areas, and to select participants.

Next, a human factors or ergonomics task group was formed. This group was composed of people with interdisciplinary skills required to concentrate on the

44

potential users and their needs. The members of this task group represented such areas as personnel, legal, MIS, planning, training, and human factors.

The group's first task was to develop an request for proposals (RFP) specifying the perceived need of the office work force. Criteria used were weighted and included functionality, support, cost, ergonomics, compatibility, expandability, reliability, documentation, and training.

The next step involved the development of a technical support team to draft guidelines for the installation and technical problem-solving processes. Also an OA training team was founded, and OA trainers received extensive training on each OA function. In addition, a self paced training program was developed and a training center was designed and dedicated to the trainees.

Prior to the installation of any OA equipment and training a siminar was given to participating management and staff in order to present them with a full view of the OA program.

The actual implementation was done in phases. Initially, a test group representing a cross section of the organization from the clerical workers to management were used as "guinea pigs". This served two purposes, it enabled the training team to work out any unforseen problems and sharpened their training skills. From this point the technology spread to participating offices in phases.

The functions were implementated in a basic package. These functions included electronic messaging, calendaring. document distribution, word processing, records processing as well as access to DP applications and resources at the host computer.

2. South Carolina's OA System

The installed system is host-based with minicomputers located at three sites, with each processor attached to the host. The host provides services for central storage, retrieval and distribution of documents. The local processors provide text and record processing capabilities. office administrative fuctionality, and access to the host computer using workstations.

3. Their Recommendations

The state government of South Carolina documented their OA progress well. As a result they have several recommendations to others considering an OA implementation. These recommedations may be obvious but many OA strategies have failed because of people's unawareness of the basics. These recommendations are:

a. Planning Phase

- Initiate OA on a small scale. This minimizes risk and provides options to investigate differing vendor products without any major investment or commitment.

- Investigate leasing instead of procurement.

- Review current office procedures for redundancies and bottlenecks. Procedural chances could have an adverse affect.

46

- Carefully review each user's needs. One type of workstation might not be suitable for all.

- Place reasonable goals and expectations on the people and the project.

- Don't lose sight of the human factors issue.

- Involve users early and give them decision-making tasks.

- Don't allow the technicians run the show. Establish a users group.

b. Implementation Stage.

- Remain flexible.

- Support user's DP needs as well as their OA needs.

- Don't introduce new technologies too quickly. Don't force users to become familiar with new devices and then replace them.

- Listen to the users' recommendations.

- Continue to provide office application support to users.

c. Evaluation Phase.

- Establish standards wherever feasible.

- Be prepared to provide quantitative gains to management.

- Document what you learn.

4. <u>South Carolina Summary</u>

South Carolina's pilot approach had demonstrated success. The project provided the staff with good and bad learning experiences without a major investment of capital. The lessons learned are easily incorporated into a full implementation of an automated system. The sucess of the

47

pilot program indicated that OA was indeed a means to increase productivity.

D. RUBBERMAID AND SOUTH CAROLINA

Acknowledged by both organizations was the need for upper management support. A simple go-ahead without enthusiastic backing can alone be enough to inhibit a sucessful OA implementation.

Both activities began their projects with a study (or planning) phase. This phase began with a conceptual plan idea, a study of the organization's needs, documentation flow, communication needs, training requirements, the equipment required to meet its goals, and a path to follow for implementation. Perhaps Rubbermaid should have considered this phase as the foundation for their pyramid.

User training was acknowledged as essential to an OA system throughout its lifecycle. Both organizations implemented a training program well before the tools arrived. This training was necessary not only to teach the user how the tools work but to curtail the shock of the administrative changes in the office as a result of the new technology.

Rubbermaid's approach was to implement an integrated system in phases, building upon the most basic needs. South Carolina implemented a pilot system to test the waters. The low risk involved with a pilot program makes it more attractive in the ever-evolving nature of today's

technology. The best method for implementation might be a combination of the two, building on a pilot.

F. CONCLUSION

The key to both these organization's success was that they had a plan for OA. They received upper management blessings and acknowledged the impact the user played in the systems development. Once their organization was assessed and their requirements known they did not hesitate in fear of changing technologies but continued on and remained flexible during the implentation.

V. IMPLEMENTING AN AUTOMATED OFFICE

A. INTRODUCTION

In the preceding chapters concepts, applications, and the technologies involved in the field of office automation have been discussed. This chapter will discuss a method that NFC can use in the introduction of OA. From the outset, it is important to realize that implementing office automation systems involves more than simply buying the relevant hardware and software, conducting basic training, and installing and running it. Any organization which adopts this approach is likely to have a system which fails completely, which does not meet its objectives, or which does not realize the productivity improvements and cost benefits required of it.

The implementation of office automation systems requires considerable planning in all respects to ensure that the system operates as satisfactorily as possible. An office automation study needs to be carried out to identify what work is being performed in which office, to develop an office processing strategy to determine what the hardware and software requirements are, and to relate potential uses and applications to users and the organization structure. Change will occur and it is necessary to plan how to manage it.

OA is not just technology, rather it is the application of this technology to the office environment. Plans need to take into account the personnel who are going to be involved in using the system. Employee concerns for loss of freedom, loss of employment, and fear of change need to be addressed. A means for combating employee resistance to new technologies needs to be determined or else that resistance will degrade the system.

The managerial approach to the implementation can vary from top down (dictatorial) to bottom up (democratic) or somewhere in between. A critical success factor is the attitude of upper management. If the attitude is merely supportive instead of enthusiastic, lower echelons will interpret it accordingly, and they will reflect the same attitude, degrading the system.

Pilot implementation of office systems provides a low-risk approach to OA and, at times, serves to break the ice when introducing a new technology. For this purpose it is the recommended methodology which will be employed in this chapter.

B. ASSIGNING RESPONSIBILITY

One of the first steps to be addressed is the appointment of a senior level officer responsibile for OA. The person appointed should have top level management support and a clear mandate to initiate the planning process. This person should have some basic knowledge of

office automation concepts and his department should be involved in the future of OA. This appointment will signal NFCs commitment to sound planning and timely introduction of the technology.

After responsibility has been assigned for OA implementation the next step involves forming a planning group in order to implement a strategic OA program to formulate, study, and make recommendations on office technology.

Given the novelty and complexity of OA planning, the planning group should be multidisciplinary in nature. It should include members from the Information System Directorate, Planning and Resources Management Department, Administrative Services Department, Comptroller, JUMPS, and other user departments. This group could be structured on either an ad hoc basic or as a permanent unit which will oversee and continue to monitor all of the office automation efforts of the organization. Drawing members from these varying departments serves a two-fold purpose. It provides first-hand knowledge of what goes on in those departments, and it allows a feedback mechanism which keeps those departments advised of the OA impact in their area.

C. ASSESSING THE OA REQUIREMENT

After responsibility has been assigned and the planning group formed, the next step involves an indepth assessment of NFC's mission and its departmental objectives and

procedures used to meet this goal. This involves going down to the most basic procedures and working back up. In addition, the information media (voice, text, image, etc.) must be reviewed to determine its applicability to OA.

.. Information Collection

Typically, the assessment begins with four types of measurements: discussion with department heads, discussion with key office personnel, observation of office activities, and secondary sources.

a. Discussion with Department Heads

This is necessary to obtain a initial view of the organization's objectives, current systems, and current system plans. In addition, the department heads should be briefed on key aspects of OA and the methodology of the assessment. Prior to the interview the department head should be provided a pre-interview memorandum describing the nature of the interview and what is expected on his part. This will enhance the process by allowing the department head to think about OA and how it could benefit his organization. The National Bureau of Standards (NBS) has published sample worksheets that provide guidance in conducting such an interview [Ref. 19]. These worksheets are provided as Appendix A.

b. Discussion with Key Office Personnel

The purpose of these interviews is to determine information flow, time requirements, office methods, and,

among other things, training requirements. It is an effort to break down into measurable terms what the employee does to support the organization's mission. These interviews should be conducted with a representative sample of the organization work force. Appendix B contains NBS guidance questionnaires for this purpose.

    c.   Observation of Office Activities

To complement the interviews, additional data may be obtained through monitoring office activities. Possible methods to accomplish this is through direct observation by a member of the study team or having personnel self-document their activities in a daily activity log. Office activity should be monitored for a minimum of five working days to ensure the sample reflects the normal work environment.

Through the observations of work activities, demands and bottlenecks of current practices will be identified. The team will be able to inventory staffing, procedures, and office equipment.

    d.   Secondary Sources

Documents such as the NFC Organizational Manual, planning documents, and procedure guidelines provide the team an comprehensive overview of NFC in a minimal period of time.

2. The Diagnosis

Upon completion of the collection of data the team must review the information gathered for consistency. If any inconsistencies are noted they should be rectified by returning to their sources. Once the inconsistencies are removed the data will be analyzed to determine feasible areas for automation. The information collected can be used as a baseline to determine gains obtained by automating certain office functions and its impact on the organization.

The next step involves determining the functional specifications of the pilot system and where it should be implemented. Using the data gathered from the organization scan, multiple alternatives should be drafted. The key requirement is that the pilot should be implemented where there is a demonstrated need. However, there are other factors requiring consideration. They include:

- User acceptance

- Pilot group size

- Measurability (to provide the necessary data to support a fully operational system)

- Minimal disruption in group

- Expandability to a fully operational system

- Ease of implementation

- System design

The primary output of the diagnosis is a Pilot Feasibility Report [Ref. 20:p. 99]. This is the first external report generated by the group. Its purpose is to

advise senior management of the results of the study,
summarize pilot alternatives, and recommend a path to
follow. Outside assistance from more technically oriented
sources might be required concerning system design
questions. If senior management so desires, the project can
be terminated at this point with a minimal investment, and
the information gathered is still beneficial to NFC. Figure
5.1 is an outline of the proposed report.

1. Brief introduction to office automation
2. Summary of opportunities for improvement
3. Summary of pilot alternatives
4. Pilot proposal
   a. Configuration
   b. Functions of the system
   c. Size of pilot group
5. Functional description of the pilot
6. Proposed hardware and software description
7. Description of estimated costs and anticipated benefits
8. Future deliverables
   a. Executive briefings and demonstrations
   b. Upon approval, indepth study of recommended pilot

Figure 5.1. Pilot Feasibility Report Outline

D. PILOT IMPLEMENTATION

Once the feasibility report has been approved the
planning group must plan for the impending implementation.
In areas of system design involving technical expertise
beyond the capabilities of the group, outside assistance
should be sought. This may include areas such as system
components, configurations, interfaces, software packages,
and their specifications.

The planning group must determine organizational responsibilities for the system. Since the components of UH cross departmental boundries at NFC this is a critical requirement that may require upper management involvement before this responsibility can be assigned.

An implementation plan based upon the functional requirements obtained in the organization scan and the recommended pilot is required. This plan should include implementation steps (e.g. incremental addition of hardware or software requirements), organization and responsibilities during implementation, and the management of change.

Training programs have to be customized to take into account differences in departments and individuals. It may not be as simple as teaching someone how to use a machine, but it may involve teaching persons how to do their (perhaps new) jobs better and get more productive use of their time through using the system. Training may be accomplished through structured, well-defined classes, self-paced courses, and on-line help facilities. South Carolina realized the value of training and initiated a training team for this purpose.

Finally, evaluation criteria have to be established. The period of evaluation has to be established, perhaps six months to a year. Baseline specifications derived from the organization scan can be used to evaluate the impact of the system and provide a comparison between anticipated results

and actual results. System monitoring can provide overall utilization of the system, identify learning curves, use of applications, network utilization, and resource allocation.

This phase is completed upon submission of a pilot system specification report. This is somewhat like the pilot system feasibility report but is in far more detail. Again upper management, if they so desire, can terminate the project at this point. An example of the criteria covered in this report is shown in Figure 5.2 [Ref. 20:p. 100].

E. PILOT EVALUATION

Upon approval of the pilot specification report by upper management the pilot is installed as planned. System monitoring data are collected from the beginning of the installation into the user environment. Almost immediately changes in work habits will occur. These changes can be both expected and non-expected. This requires the implementation plan to be flexible. Evaluation criteria initially established may no longer be applicable, installation schedules may be found impossible to meet. These difficulties have to be documented and solved. The purpose of a pilot program is to note these difficulties on a lower scale rather than incur the costs and risks on a fully operational system. Once the pilot has been operational for the period recommended, various user measures will be taken. These measures will be compared with the baseline specifications to determine the impact of the pilot.

1. System Architecture
   a. Technical
      1. System components
      2. System interfaces
      3. Overview of hardware/software
      4. Context-relationship to existing systems
   b. Social
      1. Procedures
      2. Job design
      3. Environment
2. Hardware components
   a. Configuration/detailed equipment specification
   b. System site plan-physical environment for system
   c. Specification of any hardware construction
3. Software
   a. Approved packages
   b. Detailed specifications of software to be written
4. Organization design
   a. Workflow, etc., procedures
   b. System responsibilities
   c. Job design
   d. Ergonomics
5. Implementation plan
   a. Implementation steps
   b. Organization and responsibilities during
      implementation
   c. Management of change
6. Training
   a. Training responsibilities
   b. Outline of training program
   c. Evaluation plan for training
7. Evaluation
   a. System monitoring, accounting plans
   b. Procedures for refining, extending pilot system
   c. Post-test evaluation

Figure 5.2.   Pilot System Specification Report Outline

From this evaluation the recommendation to continue or terminate is made. If the decision is made to continue then an Operational System Specification Report is drafted similar to the Pilot Specification Report in Figure 5.2 but on a much larger scale.

F. INTEGRATING A FULLY OPERATIONAL SYSTEM

During the organization scan it will most likely be noted that individual department have both similar and differing needs. The design of a operational system has to take these varying needs into account. The overall system must be designed for compatibility between departments and allow for expansion.

The implementation of the operational system should progress in the order of the departments that can realize the greatest benefits from OA as defined in the organization scan. The operational system should be implemented in phases which provide certain capabilities (word processing, electronic mail, etc.) to the departments similar to Rubbermaid's pyramid. These capabilities will be defined by the diagnosis of the organization scan and the pilot system.

G. ONGOING ASSESSMENT

An ongoing assessment of the operational system will provide management with feedback about the system permitting corrective action if required. It provides data about changes in productivity, turnaround time, communication patterns, employee morale, and time consumed adjusting to

and operating the system. In addition, as users become familiar with the tools provided, demands for increased capabilities will arise.

H.   CONCLUSION

In this chapter essentials of planning for office automation were introduced. While the methodology discussed is by no means the only planning technique, the intent was to provide a possible blueprint for planning for automation. The pilot implementation discussed allows for termination at several points, discounting the project's risk. The early approach of piece-meal adoption of OA is no longer feasible. The planning group approach stresses the functional needs and the matching of these needs to technological capabilities in order to accomplish organizational objectives more effectively.

VI. SUMMARY

This thesis has provided both an introduction to office automation and a methodology for implementation. The Navy Finance Center has already made steps to automate its office functions as is evident in its myriad of personal computers, software, word processors, and other electronic office tools.

Chapter II introduced the need for increased productivity in the office environment as well as the technologies of office automation. Individual corporations have differing needs and not all the technologies discussed are required by all. Only by assessing the organization can the manager determine what is necessary to increase the effectiveness of his organization.

Chapter III discussed the Navy Finance Center's mission and organization. The introduction of fully integrated office automation clearly crosses departmental responsibility boundaries. In order to move toward a truly integrated office, organizational policy should be established concerning control and compatibility of office equipment.

Chapter IV reviewed two successful implementations of integrated office automation systems. Although they both

62

varied in the actual implementation, similarities existed in how they planned for the introduction of the systems.

An approach that the Navy Finance Center could follow to implement an integrated office system was introduced in Chapter V. A low-risk approach involving pilot systems is recommended to avoid an initially high overhead and ensure system applicability. The organizational assessment should be performed regardless of the intent to automate. The survey of how work is accomplished could alone increase organizational efficiency by bringing to light bottlenecks and deficiencies in current office procedures.

Office automation not only involves introducing technical innovations into the office, but also the integration and management of these innovations to ensure that the information obtained is timely and accurate. To achieve a successful integration it is necessary to establish control over the office technologies.

Like many computer-oriented technologies the OA movement is young and confused, yet it has an enormous business potential. Many corporations have decided to sit back in fear of automating their office because their new system may be quickly antiquated by something newer. However, a well planned addition of office systems will take into consideration future growth and alleviate this fear.

APPENDIX A

KEY PRODUCT ANALYSIS

NAME _____

DATE _____

TOTAL HOURS _____

WORKSHEET FOR _____
(Product Activity)

TASKS (PROFESSIONAL LEVEL)	PROFESSIONAL PERSONHOURS	FUNCTIONS		
		BY YOU (type and hours)	BY SUPPORT (type and hours)	SUPPORT TYPE FUNCTION
PLANNING				1. TYPING
CONSULTING				2. DICTATING
COLLECTING DATA				3. TRANSCRIBING
SORTING & EVALUATING DATA				4. FILING
PREPARING DRAFT				5. DUPLICATING
REVIEWING/REVISING DRAFT				6. DISTRIBUTING
COORDINATING				7. PRINTING
OBTAINING APPROVALS				8. COMMUNICATING
DISSEMINATING				9. DATA PROCESSING
MAINTAINING RECORDS				

KEY PRODUCT INTERVIEW GUIDE

Name _____

Date _____

Product _____

TASK STATEMENT

1. Describe your work in accomplishing each task identified
   on the worksheet.

ACTIVITY QUESTIONS

2.   In   performing the activity described on the worksheet,
     what inputs were required from other people/ offices?

what	from where	how (mail, etc.)	how long
----------	----------------	----------	----------------
----------	----------------	----------	----------------
----------	----------------	----------	----------------
----------	----------------	----------	----------------
----------	----------------	----------	----------------

3.   Which inputs listed in question #2 were critical for
     your continuing to progress in this activity?

     _____

     _____

     _____

     _____

     _____

4. To what degree did you have to manipulate the inputs
    listed in question #2 to accomplish your activity?

                                   heavy   moderate   light   none

    _____   _____   _____   _____   _____

    _____   _____   _____   _____   _____

    _____   _____   _____   _____   _____

    _____   _____   _____   _____   _____

    _____   _____   _____   _____   _____

5. Did you experience any problems of delays in doing your
    work?

    _____ yes   _____ no

    If yes, what was the cause and the result?

6. If clerical support type functions were performed by
    you, why?

7. Can you estimate the extent to which you used the office
    equipment listed below?

    hours of use

    _____   typewriter

    _____   word processor

    _____   copier

    _____   telephone

    _____   facsimile

    _____   dictation equipment

    _____   other (explain: _____
                      _____

8. Do you maintain any files on the product?

_____ yes   _____ no

If yes, for what purpose?

PRODUCT SUMMARY

9. Do you have any suggestions -- organizational,
   procedural, or technological -- for improvement of
   product preparation?

_____ yes   _____ no

If yes, what and how would it help?

67

OFFICE WORK ANALYSIS

Date: _____

PROFESSIONAL QUESTIONNAIRE

Name _____ Years in present position ___

Title _____ Years with organization __

Office _____ Full Time __ Part Time __ (#hrs ___)

JOB CHARACTERISTICS

1. Was your workload during the study period:

   _____ lighter than normal

   _____ normal

   _____ heavier than normal

2. Are you now performing any administrative functions that
   could be delegated to a secretary if the support were
   available?

   _____ typing   _____ posting information

   _____ proofreading   _____ preparing forms

   _____ photocopying/collating   _____ math calculations

   _____ filing   _____ research

   _____ telephone coverage   _____ maintaining office

   _____ mail sorting/delivery   _____ business errands

   _____ composing letters, etc.   _____ using facsimile

   _____ taking dictation   _____ other (what? _____)

3. Can you think of any repetitive activities you perform
(e.g., recordkeeping, math computations, data analysis,
etc.) that could be done more effectively using
automated tools?

_____ yes   _____ no

If yes, please describe.

INFORMATION/DATA SOURCES

4. What percent of the information/data that you need
during an average day is produced by:

_____ % your office

_____ % other offices in your organization

_____ % other government agencies (who? _____)

_____ % other sources (who? _____)

In what format do you usually receive this information?

_____ % computer format

_____ % handwritten

_____ % typed

_____ % other (explain: _____)

5. What percent of the information/data that you need
during an average week is existing information in your
organization that you must collect and reformat for your
own use? _____ %

6. To what extent do you have problems receiving the information in question 5 on a timely basis?

_____ very often   _____ sometimes

_____ often   _____ rarely

If problems, please describe:

LEVEL OF SECRETARIAL SUPPORT

7. Who provides most of your secretarial support?

_____ my personal secretary

_____ a secretary I share with others

_____ several secretaries I share with others

_____ no one, I do my own clerical work
                                    (SKIP TO QUESTION 14)

What is the name(s) of your secretary(ies)?

_____

8. If you share secretaries, how many other professionals do they support (excluding yourself)? _____

9. When the secretary is absent, how do you get your work done?

_____ wait for the secretary to return

_____ request work elsewhere as a favor

_____ other (explain: _____)

10. When you are out of the office for a full day or more,
    how does your secretary(ies) usually spend his or
    her time?

    _____ does work assigned by me

    _____ catches up on work that has backlogged

    _____ does what needs to be done

    _____ works for other people he or she regularly support

    _____ assigned temporarily to another work group/department

    _____ do not know

11. Does your secretary get assistance when work gets
    backlogged?

    _____ yes   _____ no

    If yes, how?

12. How satisfied are you with the level of secretarial
    support provided?

    _____ very satisfied   _____ somewhat satisfied

    _____ satisfied   _____ not satisfied

13. What are the five most critical functions the
    administrative support staff performs for you during
    the average week?

    _____ typing   _____ posting information

    _____ proofreading   _____ preparing forms

    _____ photocopying/collating _____ math calculations

    _____ filing   _____ research

    _____ telephone coverage   _____ maintaining office

    _____ mail sorting/delivery _____ business errands

    _____ composing letters, etc. _____ using facsimile

    _____ taking dictation   _____ other (what? _____)

14. How would you describe your need for secretarial support?

_____ steady   _____ peaks and valleys

If you checked peaks and valleys, when do peaks occur?

_____ particular time(s) of day (why? _____)

_____ particular day(s) of week (why? _____)

_____ particular month(s) (why? _____)

_____ unpredictable

DICTATION

15. During the average week, do you dictate?

_____ yes   _____ no

If yes, you dictate to:

_____ secretary (who: _____)

_____ dictation equipment

16. What documents do you dictate?

_____ 1 page

_____ 2-5 pages

_____ 6-10 pages

_____ over 10 pages

17. If you have access to dictation equipment, but do not use it, why?

18. Have you ever received dictation equipment training?

_____ yes, from vendor   _____ no

_____ yes, from other source (who? ___ ___   )

If yes, was it helpful? _____ yes   no

19. Would you like to receive (additional) dictation training?

_____ yes   _____ no

20. If you do not currently have access to dictation equipment, would you like to use it?

_____ yes   _____ no (why? _____ _____)

TYPING REQUIREMENTS

21. What are your typing requirements during the week?

	typical week	heavy week
1-5 pages	_____	_____
6-10 pages	_____	_____
11-19 pages	_____	_____
20 or more pages	_____	_____

22. What are the average number of typed pages in documents you generate during the week?

_____ 1   _____ 4-9   _____ 20-40

_____ 2-3   _____ 10-19   _____ over 40

23. What percent of the typed work you generate weekly consists of:

_____ % original text

_____ % standardized text

_____ % columns of numbers (statistical)

_____ % pre-printed forms fill-ins

_____ % graphs/illustrations

_____ % other (explain: _____)

24. When you find secretarial errors your typing, what usually happens?

_____ white-out is used

_____ retype entire page

_____ retype corrections on original page

_____ write corrections by hand

_____ other (explain: _____)

25. Is the level of typing support available to you adequate?

	typical week	heavy week
adequate	_____	_____
not adequate	_____	_____

If not adequate, why?

26. What percent of the work you submit for typing during an average week is:

_____ % typed by you

_____ % written completely by longhand

_____ % dictated to a secretary

_____ % dictated on equipment

_____ % cut and pasted (including some longhand)

_____ % computer generated

_____ % extracted from previously typed material

_____ % other (explain: _____)

27. If you type yourself either in draft or final form, why?

_____ personal preference

_____ hasten turnaround time

_____ secretary not available

_____ other (explain: _____)

28. Do revisions cause problems in meeting typed material deadlines?

_____ very often   _____ sometimes

_____ often   _____ rarely

If often, why?

29. How satisfied are you with the appearance of documents leaving the office?

_____ very satisfied   _____ somewhat satisfied

_____ satisfied   _____ not satisfied

If not satisfied, why?

30. For what percent of the work you submit for typing during an average week do you assign priorities?

_____ % high priority (immediate attention)

_____ % standard (a day or less)

_____ % low (next several days)

_____ % no priority assigned

Are priorities usually met?

	yes	no
high priority	_____	_____
standard	_____	_____
low	_____	_____

FILING

31. What files do you regularly access?

_____ active (regularly used by one or more individuals
       contains materials relating to on-going
       activities)

_____ inactive (regularly used by one or more
       individuals; contains archival records)

_____ other (what? _____)

32. Who does the initial filing?

	active files	inactive files
I do	_____	_____
other professionals	_____	_____
my secretary	_____	_____
other secretaries	_____	_____

33. Who usually retrieves and returns materials to the files?

	active files	inactive files
I do	_____	_____
other professionals	_____	_____
my secretary	_____	_____
other secretaries	_____	_____

34. How often do you use file materials during the average week?

	active files	inactive files
several times/day	_____	_____
once a day	_____	_____
2 or 3 times/week	_____	_____
once a week or less	_____	_____

35. Is file access a problem?

_____ yes   _____ no

If yes, why?

PHOTOCOPYING REQUIREMENTS

36. What percent of your photocopying during an average
    week is done by:

    _____ % you

    _____ % another professional

    _____ % secretarial staff

    _____ % duplication/print shop

    _____ % other (explain: _____)

37. Approximately how many pages do you copy or have copied
    for you?

                                    pages

    typical week   _____

    heavy week   _____

38. What is the total number of copies you usually make
    or have made during a typical week? _____ copies

39. How satisfied are you with the quality of photocopies?

    _____ very satisfied   _____ somewhat satisfied

    _____ satisfied   _____ not satisfied

DISTRIBUTION

40. How much of your work during an average week is
distributed through:

_____ % internal mail within building

_____ % internal mail outside building

_____ % hand-carried inside office

_____ % hand-carried outside office

_____ % U.S. mail

_____ % facsimile

_____ % commercial air express

_____ % other (how? _____)

41. On the average, how long does it take for you to receive
documents via internal mail from others?

_____ less than a half day

_____ one day

_____ two days

_____ other (how long? _____)

42. Is the internal mail system responsive to your needs?

_____ yes   _____ no

If no, why?

If no, how do you compensate?

_____ facsimile

_____ hand-carrying

_____ other (what? _____)

43. What materials do you usually <u>not</u> send via internal mail?

_____

_____

_____

_____

Why?

_____ for review, coordination

_____ for discussion

_____ to hasten processing

_____ other (explain: _____)

Date: _____

ADMINISTRATIVE SUPPORT QUESTIONNAIRE

Name _____ Years in present position ____

Title _____ Years with organization _____

Office _____ Full Time __ Part Time __ (#hrs ___)

JOB CHARACTERISTICS

1. Was your workload during the study period:

   _____ lighter than normal

   _____ normal

   _____ heavier than normal

2. Can you think of any repetitive activities you perform
   (e.g., recordkeeping, math computations, data analysis,
   etc.) that could be done more effectively using
   automated tools?

   _____ yes   _____ no

   If yes, please describe.

3. How many people do you provide the following support to?

   number of people

   _____   secretarial/administrative support

   _____   telephone coverage

   Who is primary support provided to? _____

4. Do you feel the people you support are aware of how
   much work you have?

   _____ usually   _____ sometimes   _____ rarely

5. What are the five most critical functions the administrative support staff performs for you during the average week?

_____ typing   _____ posting information

_____ taking dictation   _____ preparing forms

_____ photocopying/collating   _____ math calculations

_____ filing   _____ research

_____ telephone coverage   _____ maintaining office

_____ mail sorting/delivery   _____ business errands

_____ composing letters, etc.   _____ using facsimile

_____ transcribing   _____ other (what? _____)

6. How would you describe your workload?

_____ steady   _____ peaks and valleys

If you checked peaks and valleys, when do peaks occur?

_____ particular time(s) of day (why? _____)

_____ particular day(s) of week (why? _____)

_____ particular month(s) (why? _____)

_____ unpredictable

7. Who usually prioritizes your work?

_____ I do

_____ person I primarily support

_____ all the people I support

_____ secretarial supervisor or head secretary

_____ other (explain: _____)

8. If you receive assistance when your work gets
    backlogged, how are other secretaries asked for help?

    _____ I don't get any assistance

    _____ I ask them

    _____ head secretary asks them

    _____ person(s) I support asks them

    _____ other (explain: _____ _____)

9. How often does your work get backlogged to the extent
    that extra assistance is required?

    _____ very often (once a week or more)

    _____ often (several times a month)

    _____ occasionally (every few months)

    _____ rarely (several times a year)

10. When the people you work for are out of the office on
    business for a full day or more, how do you usually
    spend your time.

    _____ I do work assigned by the people I regularly
          support

    _____ I catch up on work that is backlogged

    _____ I do what I feel needs to be done

    _____ I am assigned temporarily to another work
          group/department

11. Does someone else handle your work when you are
    on vacation or absent?

    _____ usually   _____ sometimes   _____ rarely

82

12. Do you maintain a procedures book detailing your
    secretarial responsibilities?

    _____ yes   _____ no

                                          yes no don t know

    If you keep a procedure book,   ___ ___   ___
    could it be improved?

    Do you follow it regularly?   ___ ___   ___

    Could another person use it
    to do your work?   ___ ___   ___

    Does the person(s) you
    support review it periodically?   ___ ___   ___

13. How many hours do you work overtime during a typical
    week? _____ hours

DICTATION

14. Do you take dictation?

    _____ yes   _____ no

    If no, why?

15. Do you have access to transcription equipment?

    _____ yes   _____ no

    If yes, do you use the transcription equipment?

    _____ yes   _____ no (why? _____)

16. What is your reaction to transcribing from equipment?

    _____ never used it   _____ like it   _____ dislike it

    If you dislike, why?

TYPING

17. On what kind of equipment do you now do your typing?

    _____ do not type

    _____ typewriter

    _____ word processor (manufacturer & model _____)

18. What is your total typing output during a week?

	typical week	heavy week
1-5 pages	_____	_____
6-10 pages	_____	_____
11-19 pages	_____	_____
20 or more pages	_____	_____

19. What are the average number of pages in documents you typed during a week?

    _____ 1   _____ 4-9   _____ 20-40

    _____ 2-3   _____ 10-19   _____ over 40

20. What percent of your weekly typing consists of:

    _____ % original text

    _____ % standardized text

    _____ % columns of numbers (statistical)

    _____ % pre-printed forms fill-ins

    _____ % graphs/illustrations

    _____ % other (explain: _____)

21. When you find typing errors your work, what usually happens?

    _____ white-out is used

    _____ retype entire page

    _____ retype corrections on original page

_____ write corrections by hand

_____ other (explain: _____)

22. What percent of the work you type during an average week is submitted:

_____ % written completely by longhand

_____ % dictated to you

_____ % transcribed

_____ % cut and pasted (including some longhand)

_____ % computer generated

_____ % previously typed

_____ % other (explain: _____)

23. For what percent of the work you type during an average week has a priority been assigned?

_____ % high priority (immediate attention)

_____ % standard (a day or less)

_____ % low (next several days)

_____ % no priority assigned

24. How satisfied are you with the appearance of documents you type when they leave the office?

_____ very satisfied   _____ somewhat satisfied

_____ satisfied   _____ not satisfied

If not satisfied, why?

25. How interested are you in using (or learning to use) a word processor?

_____ very interested   _____ somewhat interested

_____ interested   _____ not interested

FILING

26. What files do you regularly access?

_____ active (regularly used by one or more individuals contains materials relating to on-going activities)

_____ inactive (regularly used by one or more individuals; contains archival records)

27. Who does the initial filing?

	active files	inactive files
I do	_____	_____
professional(s) I support	_____	_____
other professionals	_____	_____
other secretaries	_____	_____

28. Who usually retrieves and returns materials to the files?

	active files	inactive files
I do	_____	_____
professional(s) I support	_____	_____
other professionals	_____	_____
other secretaries	_____	_____

29. If you obtain and return materials, how often?

	active files	inactive files
several times/day	_____	_____
once a day	_____	_____
2 or 3 times/week	_____	_____
once a week or less	_____	_____

30. Is file access a problem?

_____ yes   _____ no

If yes, why?

PHOTOCOPYING

31. Approximately how many pages do you copy?

                                        pages

typical week   _____

heavy week   _____

32. What is the total number of copies you usually make
during a typical week? _____ copies

33. How satisfied are you with the quality of photocopies
you make?

_____ very satisfied   _____ somewhat satisfied

_____ satisfied   _____ not satisfied

DISTRIBUTION

34. How much of your work during an average week is
distributed through:

_____ % internal mail within building

_____ % internal mail outside building

_____ % hand-carried inside office

_____ % hand-carried outside office

_____ % U.S. mail

_____ % facsimile

_____ % commercial air express

_____ % other (how? _____)

35. On the average, how long are the distribution lists you use?

_____ I do not use distribution lists

_____ 1-6 addresses

_____ 7-10 addresses

_____ over 10 addresses

36. How often do you use your distribution lists?

_____ 3-4 times a week or more

_____ 1 or 2 times a week

_____ once or twice a month

_____ less than once a month

37. Do you hand-carry materials to other offices?

_____ yes   _____ no

If yes, on the average how often and where?

38. Do you use facsimile equipment?

_____ yes   _____ no

If yes, on the average how many pages do you send and/or receive each week?

_____ pages sent   _____ pages received

WORD PROCESSOR SUGGESTED QUESTIONNAIRE

1. How many hours a week do you usually use the word processor?

   _____ # hours

2. How would you rate the ease of operating your automated equipment?

   _____ very easy

   _____ easy

   _____ difficult

   _____ very difficult

3. Who trained you initially to use the word processor?

4. Do you keep a paper copy of materials stored on cards, cassettes, diskettes, or disks?

   _____ always   _____ occasionally

   _____ usually   _____ rarely

   If so, why?

5. If you have access to a word processor but do not use it, why?

LIST OF REFERENCES

1. Engel,G.H., Groppuso,J., Lowenstien.R.A., and Traub,W.G..
    "An Office Communication System", IBM_System_Journal,
    v. 18, 1979.

2. Gow, K.F., Ricks, B.R., "Survey of Use of Integrated
    Technologies", ARMA_Quarterly, v. 18, January 1984.

3. Inglesby, T., "The Corporate Future of PCs and
    Mainframes", Infosystems, v. 31, Part 2, June 1984.

4. Seymour, J., "OCR-Fit For the Desk", Today's_Office,
    v. 18, April 1984.

5. Lewin, L., Telecommunications_in_the_United States:
    Trends_and_Policies, Artech House, Inc.,
    610 Washington Street, Bedham, Mass., 1981.

6. Johantgen, B., "Videoconferencing: A Brave New World",
    Computerword_OA, v. 16, March 7,1982.

7. Brown, M., "Electronic filing-definitely not a paper
    tiger", Data_Management, v. 21, August 1983.

8. Stallings, W., Local_Networks, Macmillan
    Publishing Co., 1984.

9. Craven, T.E., "Network Management: What Lies Ahead",
    Computerword_OA, v. 17, December 7, 1983.

10. Dow, K.F., Ricks, B.R., "Survey of Use of Integrated
    Technologies", ARMA_Quartly, v. 18, January 1984.

11. Navy Finance Center Instruction P5400.2E, Navy_Finance
    Center_Organizational_Manual, Dec. 17, 1982.

12. Dinardi, C., Interview, Management Analyst,
    NFC Cleveland, 17 August 1984 and 20 August 1984.

13. Smith, R., Interview, Communication Technician,
    NFC Cleveland, 15 August 1984.

14. Distefano, K., Interview, Management Analyst,
    NFC Cleveland, 17 August 1984.

15. Collier, B., Interview, Secretary, NFC Cleveland,
    20 August 1984.

16. Hovey, K., Interview, Office Services Manager, NFC Cleveland, 13 August 1984.

17. "A Well-Mapped OA Journey", _Office Administration & Automation_, v. XLV, January 1984.

18. Klaunk, D.R., "Nothing Could Be Finer Than OA In Carolina", _Computerworld OA_, v. 18, No. 15A, April 11, 1984.

19. National Bureau of Standards Special Publication 500-72, _Guidance on Requirements Analysis for Office Automation Systems_, U.S. Government Printing Office, Washington, D.C., December 1980.

20. Tapscott, D., _Office Automation: A User-Driven Method_, Plenum Press, 233 Spring Street, New York, 1982.

INITIAL DISTRIBUTION LIST

                                                              No. Copies

1.   Defense Technical Information Center   2
      Cameron Station
      Alexandria, Virginia 22314

2.   Library, Code 0142   2
      Naval Postgraduate School
      Monterey, California 93943

3.   Curricular Office, Code 37   1
      Computer Technology
      Naval Postgraduate School
      Monterey, California 93943

4.   Professor D. C. Boger, Code 54Bk   1
      Naval Postgraduate School
      Monterey, California 93943

5.   Professor N. R. Lyons, Code 54LB   1
      Naval Postgraduate School
      Monterey, California 93943

6.   Captain C. E. Baker, Sr., Code 5   2
      Anthony J. Celebreeze Federal Building
      Navy Finance Center
      Cleveland, Ohio 44199

7.   Lieutenant Commander J. L. Barrett, Code 522   2
      Anthony J. Celebreeze Federal Building
      Navy Finance Center
      Cleveland, Ohio 44199

END

FILMED

5-85

DTIC